Interior Lighting Power Density Examples

The following pages show 4 interior lighting power density (LPD) examples.

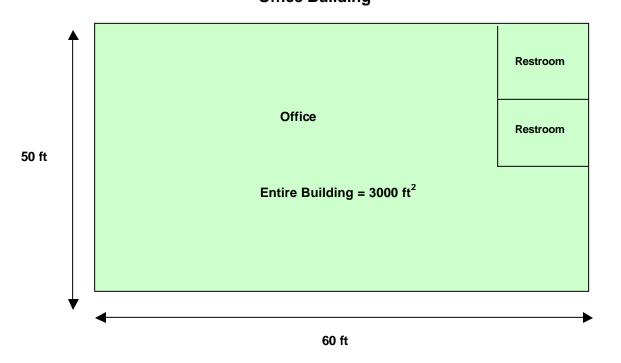
The first uses the Building Area Method for an office building.

The second uses the Building Area Method for a multi-occupancy building.

The third uses the Space-by-Space Method for a retail building.

The fourth uses the Space-by-Space Method for a same retail building used in the third example, but adds the optional additional interior lighting power allowance for a display case.

Interior Lighting Power Density Example Using the Building Area Method Office Building



Site Information

The building is 3000 ft²

The building's primary occupancy is office space

Using the Vermont 2005 Guidelines for Energy Efficient Commercial Construction lets determine the interior lighting power density allowance (LPD).

Refer to Table 805.5.2 in the Vermont Guidelines to help determine the maximum interior LPD allowances using the Building Area Method.

From Table 805.5.2 in the Vermont Guidelines the maximum interior LPD for an office building is 1.0 Watts per ft²

Determining the Interior Lighting Power Allowance for the building

- The building type is an office.
- The maximum LPD for an office is 1.0 W/ft².
- The building area is 3000 ft².
- The Total Interior Lighting Power Allowance is 1.0 W/ft² x 3000 ft² = 3000 Watts.

Refer to the Example Interior Lighting Power Density Worksheet section named Interior Lighting Power Allowance (Building Area Method) to see how this information would be entered on the code compliance worksheet.

Determining the Interior Connected Lighting Power

- The office building had the following lighting installed:
 - o Luminaire Description is 3 Lamp F32T8 with electronic ballasts
 - o Total number of Luminaires is 30.
 - o Watts per Luminaire is 93.
 - o The Total Interior Connected Lighting Power is 30 Luminaires x 93 Watts per Luminaire = 2790 Watts.

Refer to the Example Interior Lighting Power Density Worksheet section named Interior Connected Lighting Power (Building Area Method) to see how this information would be entered on the code compliance worksheet.

VERMONT 2005 GUIDELINES FOR ENERGY EFFICIENT COMMERCIAL CONSTRUCTION CODE COMPLIANCE WORKSHEETS

INTERIOR LIGHTING POWER DENSITY WORKSHEETS

Office Building	10	10 Energy Way, Megawatt City, VT 05555				
Project Description	Site	Site Address (street, town, ZIP Code)				
	ver Density (LPD) Method Used od – (Complete Building Area Method Section) ethod – (Complete Space-by-Space Method Section) ASHRAE Standard 90.1					
В	uilding Area N	Method Section				
Interior Lighting Power Allowance (Bui	Iding Area Method)					
Building Type	LPD (W/ft ²)	Building Area (ft ²)				
Office	1.0	3000	3000			
	1					
	Total Inter	l rior Lighting Power Allowar	nce (W) 3000			
			3000			
Interior Connected Lighting Power (Bu	ilding Area Method					
Luminaire Description	# of Luminaires	Watts Per Luminair	e Total Watts			
3 Lamp F32T8 w/ electronic ballasts	30	93	2790			
		onnected Lighting Pow				
Lighting Power Density is in Compliance	if the Total Interior Co Interior Lighting Po	0 0	r (W) is less than or equal to the Total			

Space-by-Space Method Section

Interior Lighting Power Allowance (Space-by-Space Method)						
Building Type		pace Type	LPD (W/ft ²)	Space Area	a (ft²)	Lighting Power Allowance (W)
N/A						
Total Interior Lighting Power Allowance (W)						
Total Interior Lighting Power Allowance (W)						
Interior Connected Lighting Pov	Nar (Sna	re-hy-Snace Met	hod)			
Luminaire Description	vei (Spa	# of Luminaires	Watts Per	Luminaire		Total Watts
Lamman o Description		# Of Lutilitaties Walts Fet Lutilitatie Total Walts				

Interior Connected Lighting Power (Space-by-Space Method)							
Luminaire Description	# of Luminaires	Watts Per Luminaire	Total Watts				
	Total Interior Co	onnected Lighting Power (W)					
	10 11 T 1 1 1 1 1						

Space-by-Space Method Section Additional Interior Lighting Power Allowance (Optional)

The Additional Interior Lighting Power Allowance is an optional section of the Space-by-Space LPD Method to be used only for specific purposes, such as decorative lighting or retail display lighting. The Additional Interior Lighting Power Allowance can only be used for its intended purpose and cannot be traded off to be used for general interior lighting power allowance.

Unit Allowance

(W/ft2)

Allowance (W)

Installed Power (W)

Area (ft2)

Additional Interior Lighting Power Allowance (Space-by-Space Method)

Type

Space or Display

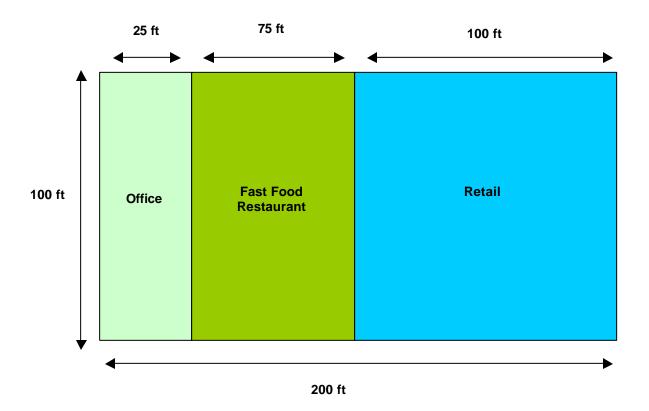
N/A

Additional Interior Connecte	ed Lighting Power	(Space-by-S	Space Method)		
Space or Display	Luminaire Desc	ription	# of Luminaires	Watts Per Luminaire	Total Watts

Interior Lighting Power Density Example

Using the Building Area Method

Multi-Occupancy Building



Site Information

The building is 20000 ft²

The building is multi-occupancy that has the following: 2500 s^2

Office space at 2500 ft²

Fast Food Restaurant space at 7500 ft²

Retail space at 10000 ft²

Using the Vermont 2005 Guidelines for Energy Efficient Commercial Construction lets determine the interior lighting power density allowance (LPD).

Refer to Table 805.5.2 in the Vermont Guidelines to help determine the maximum interior LPD allowances using the Building Area Method.

From Table 805.5.2 in the Vermont Guidelines the maximum interior LPD for an office building is 1.0 Watts per ft², fast food restaurant is 1.4 Watts per ft², and retail is 1.5 Watts per ft².

Determining the Interior Lighting Power Allowance for the building

- The building type is multi-occupancy that has office space at 2500 ft², fast food restaurant space at 7500 ft², and retail space at 10000 ft².
- The maximum LPD for an office is 1.0 Watts per ft², fast food restaurant is 1.4 Watts per ft², and retail space is 1.5 Watts per ft².
- The Total Interior Lighting Power Allowance is $(1.0 \text{ W/ft}^2 \text{ x } 2500 \text{ ft}^2) + (1.4 \text{ W/ft}^2 \text{ x } 7500 \text{ ft}^2) + (1.5 \text{ W/ft}^2 \text{ x } 10000 \text{ ft}^2) = 28000 \text{ Watts.}$

Refer to the Example Interior Lighting Power Density Worksheet section named Interior Lighting Power Allowance (Building Area Method) to see how this information would be entered on the code compliance worksheet.

Determining the Interior Connected Lighting Power

- The building had the following lighting installed:
 - Luminaire Description is 3 Lamp F32T8 with electronic ballasts, a total of 240 of these luminaires where installed, and they have 93 Watts per Luminaire.
 - o Luminaire Description is 26-W hardwired compact fluorescents with electronic ballasts, a total of 140 of these luminaires where installed, and they have 28 Watts per Luminaire.
 - o Luminaire Description is 60-W rated Incandescent lamps, a total of 20 of this luminaires where installed, and they have 60 Watts per Luminaire.
 - The Total Interior Connected Lighting Power is (240 Luminaires x 93 Watts per Luminaire) + (140 Luminaires x 28 Watts per Luminaire) + (20 Luminaires x 60 Watts per Luminaire) = 27440 Watts.

Refer to the Example Interior Lighting Power Density Worksheet section named Interior Connected Lighting Power (Building Area Method) to see how this information would be entered on the code compliance worksheet.

VERMONT 2005 GUIDELINES FOR ENERGY EFFICIENT COMMERCIAL CONSTRUCTION CODE COMPLIANCE WORKSHEETS

INTERIOR LIGHTING POWER DENSITY WORKSHEETS

Demonstration Multi-occupancy Building 1 Energy Way, Megawatt City, VT 05555				
Project Description	Site Address (street, town, ZIP Code)			
Select Interior Lighting Power Densit	pplete Building Area Me	ethod Section)	LPD Standard Used 2005 VT Guidelines For Energy Efficient Commercial Construction ASHRAE Standard 90.1-2004	
	Building Area N	Method Section	n	
Interior Lighting Power Allowance (B	uilding Area Method)			
Building Type	LPD (W/ft²)	Building Area (ft ²) Lighting Power Allowance (W	
Office	1.0	2500	2500	
Fast Food Restaurant	1.4	7500	10500	
Retail Store	1.5	10000	15000	
	Total Inte	rior Lighting Power Allov	wance (W) 28000	
Interior Connected Lighting Power (E				
Luminaire Description 3 Lamp F32T8 w/ electronic ballasts	# of Luminaires 240	Watts Per Lumin 93	<u>aire Total Watts</u> 22320	
26-W hardwired Compact Fluorescent w/ electronic ballasts	140	28	3920	
60-W Incandescent Lamps	20	60	1200	
	Total Interior Co	onnected Lighting Po	ower (W) 27440	

Space-by-Space Method Section

Interior Lighting Power Allowance (Space-by-Space Method)						
Building Type	Space Type	LPD (W/ft²)	Space Area (ft²)	Lighting Power Allowance (W)		
N/A						
Total Interior Lighting Power Allowance (W)						
Interior Connected Lighting Power (Space-by-Space Method)						

uminaire Description	ower (Space-by-Space Method # of Luminaires	Watts Per Luminaire	Total Watts
	Total Interior Cor	nnected Lighting Power (W)	

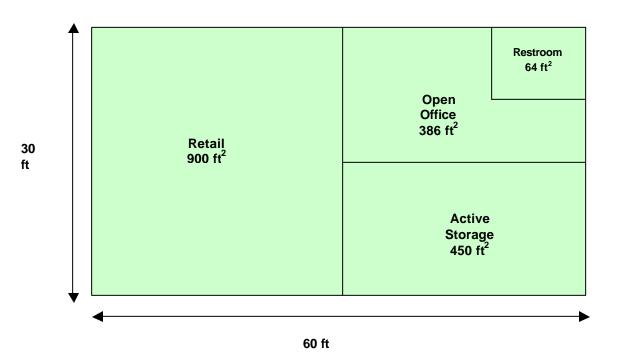
Space-by-Space Method Section Additional Interior Lighting Power Allowance (Optional)

The Additional Interior Lighting Power Allowance is an optional section of the Space-by-Space LPD Method to be used only for specific purposes, such as decorative lighting or retail display lighting. The Additional Interior Lighting Power Allowance can only be used for its intended purpose and cannot be traded off to be used for general interior lighting power allowance.

Additional Interior Lighting Power Allowance (Space-by-Space Method)						
Space or Display	Туре	Area (ft2)	Unit Allowance	Allowance (W)	Installed Power (W)	
			(W/ft2)			
N/A						
					_	

Additional Interior Connected Lighting Power (Space-by-Space Method)						
Space or Display	Luminaire Description	# of Luminaires	Watts Per Luminaire	Total Watts		

Interior Lighting Power Density Example Using the Space-by-Space Method Retail Building



Site Information

The building is 1800 ft²

The building type is Retail and has the following spaces:

Retail space at 900 ft²

Storage space at 450 ft² Office space at 386 ft²

Restroom space at 64 ft²

Using the Vermont 2005 Guidelines for Energy Efficient Commercial Construction lets determine the interior lighting power density allowance (LPD).

Refer to Table 805.5.3 in the Vermont Guidelines to help determine the maximum interior LPD allowances using the Space-by Space Method.

From Table 805.5.3 in the Vermont Guidelines the maximum interior LPD for retail space is 1.7 Watts per ft², active storage space is 0.8 Watts per ft², open office space is 1.1 Watts per ft², and restroom space is 0.9 Watts per ft².

Determining the Interior Lighting Power Allowance for the building

- The building type is retail and has the following spaces, retail space at 900 ft², active storage space at 450 ft², office space at 386 ft², and restroom space at 64 ft².
- The maximum LPD for retail space is 1.7 Watts per ft², active storage space is 0.8 Watts per ft², office space is 1.1 Watts per ft², and restroom space is 0.9 Watts per ft².
- The Total Interior Lighting Power Allowance is $(1.7 \text{ W/ft}^2 \text{ x } 900 \text{ ft}^2) + (0.8 \text{ W/ft}^2 \text{ x } 450 \text{ ft}^2) + (1.1 \text{ W/ft}^2 \text{ x } 386 \text{ ft}^2) + (0.9 \text{ W/ft}^2 \text{ x } 64 \text{ ft}^2) = 2373 \text{ Watts.}$

Refer to the Example Interior Lighting Power Density Worksheet section named Interior Lighting Power Allowance (Space-by-Space Method) to see how this information would be entered on the code compliance worksheet.

Determining the Interior Connected Lighting Power

- The spaces had the following lighting installed:
 - Luminaire Description is 3 Lamp F32T8 with electronic ballasts, a total of 24 of these luminaires where installed, and they have 93 Watts per Luminaire.
 - Luminaire Description is 26-W hardwired compact fluorescents with electronic ballasts, a total of 2 of these luminaires where installed, and they have 28 Watts per Luminaire.
 - The Total Interior Connected Lighting Power is (24 Luminaires x 93
 Watts per Luminaire) + (2 Luminaires x 28 Watts per Luminaire) = 2288
 Watts.

Refer to the Example Interior Lighting Power Density Worksheet section named Interior Connected Lighting Power (Space-by-Space Method) to see how this information would be entered on the code compliance worksheet.

VERMONT 2005 GUIDELINES FOR ENERGY EFFICIENT COMMERCIAL CONSTRUCTION CODE COMPLIANCE WORKSHEETS

INTERIOR LIGHTING POWER DENSITY WORKSHEETS

Demonstration Retail Building	ation Retail Building 1 Energy Way, Megawatt City, VT 05555				
Project Description	Site	Site Address (street, town, ZIP Code)			
Select Interior Lighting Power Density Building Area Method – (Comp X Space-by-Space Method – (Co	plete Building Area Me mplete Space-by-Spa	g Area Method Section) Ce-by-Space Method Section X Efficient Commercial Construction ASHRAE Standard 90.1-200			
В	Building Area M	lethod Section	n		
Interior Lighting Power Allowance (Bu Building Type N/A	ilding Area Method) LPD (W/ft²)	Building Area (ft²)	Lighting Power Allowance (W)	
	Total Inter	ior Lighting Power Allo	wance (M)		
			varice (vv)		
Interior Connected Lighting Power (Bu Luminaire Description	uilding Area Method) # of Luminaires	Watts Per Lumin	aire	Total Watts	
Lighting Power Density is in Compliance				less than or equal to the Total	

Space-by-Space Method Section

Illowance (Space-by-Space N	/lethod)		
Space Type	LPD (W/ft ²)	Space Area (ft²)	Lighting Power Allowance (W)
Sales Floor	1.7	900	1530
Storage	.8	450	360
Office	1.1	386	425
Restroom	.9	64	58
			<u> </u>
			-
			
			
		<u> </u>	
		 	
		-	
	Total Interior Lig	hting Power Allowance (W)	2373
	Space Type Sales Floor Storage Office	Space Type LPD (W/ft²) Sales Floor 1.7 Storage .8 Office 1.1 Restroom .9	Sales Floor 1.7 900 Storage .8 450 Office 1.1 386

Interior Connected Lighting Power (Sp	ace-by-Space Meth	od)	
Luminaire Description	# of Luminaires	Watts Per Luminaire	Total Watts
3 Lamp F32T8 w/ electronic ballasts	24	93	2232
26-W Triple CFL w/ electronic ballasts	2	28	56
Lighting Dower Density is in Compliance		Connected Lighting Power (W)	locs than ar aqual to the Total

Space-by-Space Method Section Additional Interior Lighting Power Allowance (Optional)

The Additional Interior Lighting Power Allowance is an optional section of the Space-by-Space LPD Method to be used only for specific purposes, such as decorative lighting or retail display lighting. The Additional Interior Lighting Power Allowance can only be used for its intended purpose and cannot be traded off to be used for general interior lighting power allowance.

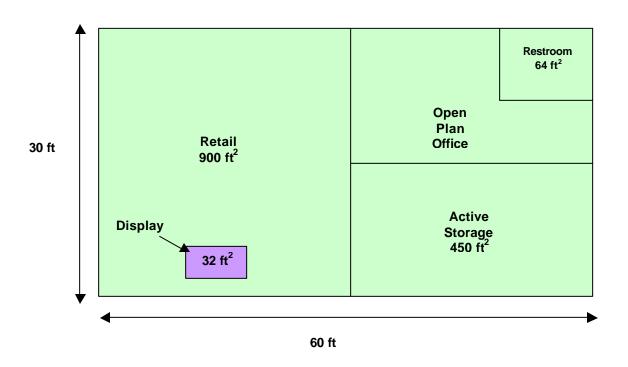
Additional Interior Lighting Power Allowance (Space-by-Space Method)						
Space or Display	Туре	Area (ft2)	Unit Allowance	Allowance (W)	Installed Power (W)	
			(W/ft2)			
N/A						
	•					

Additional Interior Connected Lighting Power (Space-by-Space Method)						
Space or Display	Luminaire Description	# of Luminaires	Watts Per Luminaire	Total Watts		

Interior Lighting Power Density Example

Using the Space-by-Space Method with the Additional Interior Lighting Power Allowance Option

Retail Building



Site Information

The building is 1800 ft²

The building type is Retail and has the following spaces:

Retail space at 900 ft²

Storage space at 450 ft²

Office space at 386 ft²

Restroom space at 64 ft²

In addition the retail space has a 32 ft² Display area for fine merchandise

Using the Vermont 2005 Guidelines for Energy Efficient Commercial Construction lets determine the interior lighting power density allowance (LPD).

Refer to Table 805.5.3 in the Vermont Guidelines to help determine the maximum interior LPD allowances using the Space-by Space Method.

From Table 805.5.3 in the Vermont Guidelines the maximum interior LPD for retail space is 1.7 Watts per ft², active storage space is 0.8 Watts per ft², open office space is 1.1 Watts per ft², and restroom space is 0.9 Watts per ft².

Determining the Interior Lighting Power Allowance for the building

- The building type is retail and has the following spaces, retail space at 900 ft², active storage space at 450 ft², office space at 386 ft², and restroom space at 64 ft².
- The maximum LPD for retail space is 1.7 Watts per ft², active storage space is 0.8 Watts per ft², office space is 1.1 Watts per ft², and restroom space is 0.9 Watts per ft².
- The Total Interior Lighting Power Allowance is $(1.7 \text{ W/ft}^2 \text{ x } 900 \text{ ft}^2) + (0.8 \text{ W/ft}^2 \text{ x } 450 \text{ ft}^2) + (1.1 \text{ W/ft}^2 \text{ x } 386 \text{ ft}^2) + (0.9 \text{ W/ft}^2 \text{ x } 64 \text{ ft}^2) = 2373 \text{ Watts.}$

Refer to the Example Interior Lighting Power Density Worksheet section named Interior Lighting Power Allowance (Space-by-Space Method) to see how this information would be entered on the code compliance worksheet.

Determining the Interior Connected Lighting Power

- The spaces had the following lighting installed:
 - Luminaire Description is 3 Lamp F32T8 with electronic ballasts, a total of 24 of these luminaires where installed, and they have 93 Watts per Luminaire.
 - Luminaire Description is 26-W hardwired compact fluorescents with electronic ballasts, a total of 2 of these luminaires where installed, and they have 28 Watts per Luminaire.
 - The Total Interior Connected Lighting Power is (24 Luminaires x 93
 Watts per Luminaire) + (2 Luminaires x 28 Watts per Luminaire) = 2288
 Watts.

Refer to the Example Interior Lighting Power Density Worksheet section named Interior Connected Lighting Power (Space-by-Space Method) to see how this information would be entered on the code compliance worksheet.

Using the Vermont 2005 Guidelines for Energy Efficient Commercial Construction lets determine the additional interior lighting power density allowance (LPD).

Refer to footnotes for Table 805.5.3 in the Vermont Guidelines to help determine the maximum additional interior LPD allowances when using the Space-by Space Method.

From the footnotes of Table 805.5.3 in the Vermont Guidelines the maximum additional interior LPD allowance for fine merchandise display is 3.9 Watts per ft².

Determining the Additional Interior Lighting Power Allowance

- In the retail space there is a 32 ft² display used for fine merchandise.
- The maximum additional interior LPD for fine merchandise is 3.9 Watts per ft².
- The additional interior LPD allowance for this display is $3.9 \text{ W/ft}^2 \times 32 \text{ ft}^2 = 125 \text{ Watts.}$

Refer to the Example Interior Lighting Power Density Worksheet section named Additional Interior Lighting Power Allowance (Space-by-Space Method) to see how this information would be entered on the code compliance worksheet.

Determining the Additional Interior Connected Lighting Power

- The display had the following lighting installed:
 - o Luminaire Description is one 120-W rated Halogen Lamp.
 - o The Total Additional Interior Connected Lighting Power is (1 Luminaire x 120 Watts per Luminaire) = 120 Watts.

Refer to the Example Interior Lighting Power Density Worksheet section named Additional Interior Connected Lighting Power (Space-by-Space Method) to see how this information would be entered on the code compliance worksheet.

VERMONT 2005 GUIDELINES FOR ENERGY EFFICIENT COMMERCIAL CONSTRUCTION CODE COMPLIANCE WORKSHEETS

INTERIOR LIGHTING POWER DENSITY WORKSHEETS

Demonstration Retail Building		1 Energy Way, Megawatt City, VT 05555			
Project Description					
Select Interior Lighting Power Density Building Area Method – (Company Space-by-Space Method – (Company Space-by-Space-	ce Method Section)	X	2005 VT Guidelines For Energy Efficient Commercial Construction ASHRAE Standard 90.1-2004		
E	Building Area N	lethod Section	n		
Interior Lighting Power Allowance (Bubuilding Type N/A	uilding Area Method) LPD (W/ft²)	Building Area (ft²)		Lighting Power Allowance (W)	
	Tatalinto	ion Linkking Down Allo			
	l otal Inter	ior Lighting Power Allo	wance (W)		
Interior Connected Lighting Power (B Luminaire Description	uilding Area Method) # of Luminaires	Watts Per Lumin	aire	Total Watts	
Lighting Power Density is in Compliance				less than or equal to the Total	

Space-by-Space Method Section

Interior Lighting Power	Allowance (Space-by-Space N	lethod)		
Building Type	Space Type	LPD (W/ft ²)	Space Area (ft²)	Lighting Power Allowance (W)
Retail	Sales Floor	1.7	900	1530
Retail	Storage	.8	450	360
Retail	Open Office	1.1	386	425
Retail	Restroom	.9	64	58
				
				
				
				
			-	
			-	Γ
			+	
			+	
			+	
		.		
		Total Interior Lig	hting Power Allowance (W)	2373

Interior Connected Lighting Power (Space-by-Space Method)						
Luminaire Description	# of Luminaires	# of Luminaires Watts Per Luminaire Total Watts				
3 Lamp F32T8 w/ electronic ballasts	24	93	2232			
26-W Triple CFL w/ electronic ballasts	2	28	56			
ballasts						
	Table 2 0					
Lighting Dower Density is in Compliance		onnected Lighting Power (W)	2288			

Space-by-Space Method Section Additional Interior Lighting Power Allowance (Optional)

The Additional Interior Lighting Power Allowance is an optional section of the Space-by-Space LPD Method to be used only for specific purposes, such as decorative lighting or retail display lighting. The Additional Interior Lighting Power Allowance can only be used for its intended purpose and cannot be traded off to be used for general interior lighting power allowance.

Additional Interior Lighting Power Allowance (Space-by-Space Method)						
Space or Display	Туре	Area (ft2)	Unit Allowance (W/ft2)	Allowance (W)	Installed Power (W)	
Retail Merchandise	Fine	32	3.9	125	120	

Additional Interior Connected Lighting Power (Space-by-Space Method)						
Space or Display	Luminaire Description	# of Luminaires	Watts Per Luminaire	Total Watts		
Retail Merchandise	120-W Halogen Lamp	1	120	120		